Testimony of

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Madam Chair and Members:

I am Arthur H. Johnson, Chairman and CEO of Hydrate Energy International. I will discuss the potential for gas hydrates as an energy resource for the United States. I have 25 years of industry experience in oil and gas exploration and have served for the past two years as chair of the Department of Energy's Methane Hydrate Advisory Committee. I am also co-chair of the Gas Hydrate Committee of the American Association of Petroleum Geologists.

The United States is entering an era of natural gas shortages during periods of peak demand. These supply shortfalls will be accompanied by significantly higher natural gas prices that, in turn, will have a serious impact on our nation's economy. In the years ahead, the shortages and price increases may become increasingly severe. Increasing the supply of natural gas from domestic sources should be a primary objective for the nation. A number of options for increasing gas supply should be considered.

First, additional areas could be opened to exploration and development, and the permitting process streamlined.

Second, imports of natural gas can be increased. Canada continues to supply a portion of America's natural gas and that volume will increase. Additional imports would require liquefied natural gas (LNG), an expensive process that is currently in use in many parts of the world. LNG imports are becoming economically feasible at current natural gas prices and a number of new domestic LNG receiving terminals are currently being designed. LNG imports have several negative aspects. Safety is an immediate concern, both with the LNG tankers and with the terminals. Gas for LNG would be supplied from fields in areas such as the Middle East, West Africa, and the Former Soviet Union; and there are concerns about America depending on the stability of these regions for its economic well-being. Beyond these issues is the fundamental observation that America is evolving from a nation that has been self-sufficient in natural gas to one that has become dependent on foreign sources. It is quite possible that in ten or fifteen years America could be importing natural gas to the same extent that it is now importing oil.

The third alternative is to pursue unconventional sources of natural gas such as deep gas, shale gas, coaled methane, and gas hydrates. This has already begun, with coalbed methane (CBM) already supplying 8% of America's natural gas production. The role of CBM is continuing to increase, especially in Wyoming, and serves as an excellent analogy for the possible development of gas hydrates. Twenty years ago, CBM was a drilling hazard and the government was criticized for conducting research in it. That effort has definitely paid off.

The best advice is to pursue all three alternatives.

This brings us to gas hydrates. Gas hydrate is a crystalline substance composed of gas and water. It forms when water and natural gas combine under conditions of moderately high pressure and low temperature. If gas hydrate is either warmed or depressurized it will revert back to water and natural gas, a process termed “dissociation”. Natural gas is concentrated in hydrate so that the dissociation of a cubic foot of hydrate will yield 0.8 cubic feet of water and approximately 160 cubic feet of natural gas. The conditions where hydrates occur are common in sediments off the coasts of the United States in water depths greater than approximately 1600 feet and at shallower depths in sediments associated with deep permafrost in the Arctic. Preliminary investigations indicate that considerable volumes of gas hydrate are present in at least some of these areas.

The total volume of gas hydrate in the United States is not known, although the results of a wide variety of investigations conducted over the past thirty years indicate that the volume is very large, on the order of hundreds of thousands of TCF. More important, however, is the amount of hydrate that can be commercially recovered. Characterization of hydrate resources that has been carried out, for example in the MacKenzie Delta of Canada, the North Slope of Alaska, offshore Japan, and elsewhere indicate that the total in less explored areas of the U.S. hydrate province is likely in the range of many thousands of TCF.

Gas hydrate investigations have been undertaken by many Federal agencies during the past 30 years. These include the U.S. Geological Survey, Naval Research Laboratory, National Science Foundation, and Department of Energy. The Methane Hydrate Research and Development Act of 2000 initiated a new program to study several aspects of gas hydrates, including seafloor stability, global climate change, and the potential of gas hydrate as a commercial resource. The resource target has been for production in the year 2020. Funding for the new program, which is managed by the DOE, has typically been on the order of $10 million per year.

The new program has enabled the United States to participate in a number of recent cooperative international investigations that have increased our understanding of gas hydrates. These include an experimental well in the Canadian Arctic last year that resulted in significant new data for use in modeling hydrate production and actually produced some gas from hydrate. A joint effort of the DOE and Anadarko Petroleum has an on-going project to drill and evaluate Arctic sediments to better understand hydrate occurrence. A joint effort of the DOE and BP Exploration Alaska is preparing a hydrate production test in approximately 18 months that should greatly improve our understanding of the commercial viability of Arctic hydrates. The U.S. Geological Survey has played a dominant role in guiding the geological and geophysical aspects of these projects. Successful results in Alaska will encourage the domestic industry to pursue hydrate opportunities in the Gulf of Mexico. It is conceivable that commercial production of gas from gas hydrate could begin, on at least a limited basis, in just a few years.

In the Gulf of Mexico, a Joint Industry Program (JIP) is engaged in characterizing gas hydrate occurrences there with matching funds provided by the DOE. The JIP is led by ChevronTexaco and includes several other U.S. and foreign oil companies, as well as the U.S. Minerals Management Service. While the stated goal of the JIP involves ensuring the safety of existing facilities, the results of the JIP program will assist in characterizing the commercial hydrate potential of the Gulf.

Other nations are also investigating gas hydrates as part of their energy security initiatives. The most significant programs are in Japan, India, and Canada. These programs are making great progress and the U.S. is benefiting from their results.

Industry interest in gas hydrates as a resource has been growing over the past year. In the past hydrates were viewed as strange and futuristic, always to be twenty years into the future. Many of the production schemes envisioned for hydrates involved exotic and expensive approaches to production that are far removed from any company’s core business. Hydrate development was viewed as requiring high operating expense, while nearly every company was striving to reduce operating expense. Hydrates also had a credibility problem, with many proponents making unrealistic projections of hydrate production capabilities.

These negative perceptions are changing as research efforts begin to show the commercial viability of hydrates. The drilling results last year at the Canadian site have led to studies showing that hydrate production need not involve high operating expense. On the North Slope of Alaska, where initial U.S. production is most likely, there is a growing industry interest in natural gas. In addition, the recent changes in the domestic gas market have encouraged companies to seek additional sources. Yet, industry is not yet ready to pursue hydrates its own.

Federal research funding is the key to proving the commerciality of gas hydrates and accelerating the development timeline. Such funding must be focused on the critical questions that need to be resolved. In addition, there needs to be continuity from one budget cycle to the next so that multi-year projects can be maintained. Incentives such as royalty relief and unconventional resource tax credits will encourage industry participation.

Recent models indicate that hydrate resources can be developed by producing gas from adjacent free-gas reservoirs. The drop in pressure will cause dissociation of the hydrate which then feeds additional gas into the reservoir. The critical questions that need to be answered involve the ultimate amount of gas that can be recovered from hydrates by each well, the daily production rate of each well, and the expenses involved in drilling and producing the wells.

Gas hydrate deposits have been identified on the North Slope of Alaska and in deep water locations off the Pacific, Atlantic, and Gulf coasts of the U.S. In the near term, hydrate prospects will only be viable in areas where there is existing conventional production so that infrastructure (platforms, pipelines, etc.) may be leveraged. This will make the North Slope of Alaska and the deepwater Gulf of Mexico the primary focus of commercial hydrate development in the U.S. for the foreseeable future. In these areas, gas hydrates have the potential to add significantly to America's natural gas production.

In summary, gas hydrates appear to occur in abundance in Arctic and U.S. territorial waters. While there are many uncertainties regarding their total resource potential, that potential appears to be significant. Technical challenges remain but are not insurmountable. We know enough to move forward.